

	A	B	C	D	E	F
	Project Number	Deep Dive Topics	Project Name	Description	Country Participation (as of July 2018), TBD=?	Analysis Type
1						
2	1	Medium and large market value chains	Upstream vs. local viral diversity	Compare viral detection rates of species in markets to the same species at their sources	Bangladesh, CIV, Cameroon, China, DRC?, Indonesia, Lao PDR?, ROC, Vietnam?	Data Modeling
3	2	Medium and large market value chains	Assessing viral sharing within market species	Within common or nearby markets, determining which species share viruses in order to recommend separation. Determine viral sharing both within specific markets, and for all PREDICT-1 (and other) data for species found in the same market	Cameroon, DRC, Lao PDR, ROC, Vietnam	Data Modeling
4	3	Medium and large market value chains	Converting live markets to non-live	Estimating reductions in viral density/diversity as a result of change from live to non-live markets. Compare estimated viral diversity and density in a live market to an equivalent non-live market or live market with fraction of time, volume, or species converted to non-live.	Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam	Mixed Data Modeling/Scenario Creation
5	4	Medium and large market value chains	Reducing market biodiversity	Estimating potential for viral recombination in markets based on species diversity and count using previously created recombination model.	Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam	Mixed Data Modeling/Scenario Creation
6	TO BE DELETED	Medium and large market value chains	Will policies for market-based interventions be accepted?	The intervention policy ideas that we are generating above, and others, may not be acceptable to governments or people within countries. This project will assess their likelihood of becoming government policy, or being adopted by people.	Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam, Ghana, Liberia, Tanzania	Mixed Data Modeling
7	6	Hunted bats in the value chain	Hunter Behavioral Risk Hotspots	To identify areas with highest risk of viral spillover from bats to hunters based on existing behaviors, propensity of local bat species to carry viruses, and likelihood for bats to be sold into the value chain	Bangladesh, Ghana, Indonesia, Nepal, Liberia, Cameroon, DRC	Data Modeling
8	7	Bat Hunting and hunted meat value chain	Bat Hunting Seasonality	Identify areas of bat hunting associated with high risk seasonality in bat viral detection	Bangladesh, China, DRC, Ghana, Indonesia, Nepal, RoC, Sierra Leone, Cambodia	Data modeling
9	8	Ecotourism/recreational/religious exposure to bat caves	Bat cave biodiversity risk	Estimating viral diversity and spillover potential in bat-dwelling caves	China, Egypt, Malaysia, Myanmar, Rwanda, Uganda, Senegal, Thailand, Kenya, Cambodia	Mixed Data Modeling/Scenario Creation

	G	H
1	Expected Policy Products or Recommendations	Existing PREDICT Data
2	Recommendations whether to focus on upstream or in-market interventions to reduce spillover	PREDICT-1 viral detection data
3	Recommendations for species segregation to reduce spread,	PREDICT-1 viral detection data from markets PREDICT-1 and PREDICT-2 species presence in markets
4	Expected degree of risk change from full conversion of markets, Expected efficacy of partial conversions and closures Identification of markets with potential for conversion	PREDICT-1 viral detection data from live and non-live samples in markets
5	Identification and ranking of markets with high recombination risk, recommendations for species segregation for those markets	PREDICT-2 Species and number of animals (live) in markets (Site and Event characterization - Main Q15)
6	Recommendations that are more likely to be adopted	PREDICT-1 and PREDICT-2 behavioral risk data
7	Target locations and behaviors for educational interventions	PREDICT-2 questionnaire data on hunter behavior, hunter module data, viral data, and as applicable, ethnographic interview data, focus group data, and observational data
8	Target locations and seasons to reduce bat hunting/drive education	PREDICT-2 questionnaire data on hunter behavior PREDICT-1 viral detections
9	Risk characterization by cave site/size/type	

	I	J
1	Other Existing Data Assets	Non-field Data Collection
2	Work with country staff to link site names for Market and upstream site data in EIDITH	
3	HP3 viral associations	
4		Literature review of viral survival at EHA (collected but not analyzed)
5		
6	Surveys of current policies within country, literature review	
7	IUCN species ranges, HP3 viral risk propensities, and other compiled host-virus published data sets	
8	IUCN species ranges	
9	HP3 and Cave bat viral sharing analysis	Find literature-based bat-specific viral sharing/recombination rates

	K	L
1	Additional Field Data Collection	Time Frame (3 mo, 6 mo, 1 yr)
2	None	Short
3	More accurate species characterization and counts in identified markets of interest	Long
4		Short
5	More accurate species characterization and counts in identified markets of interest	Long
6	Targeted qualitative data and focus groups. Interviews with Govt. agencies.	Long
7	Country team estimation of: bat species being hunted, volume of bats being hunted, and seasonality. Information from PREDICT or other collaborator expert opinion, not additinoal field work.	Med
8	Country team estimation of exact bat species being hunted. Information from PREDICT or other collaborator expert opinion, not additinoal field work.	Med
9	Rapid (~2 hour) cave assessment to characterize cave features and disturbance levels. Record knowledge of cave bat species diversity and composition.	Long

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1	Action items
2	Determine what P1 cases have same species in both markets and linked upstream sources
3	Estimate data on species diversity and numbers from P2 site characterizations in market modules
4	Determine which countries are we sampling from dead animals in non-live markets. Can we identify comparable live and non-live markets?
5	Building on Parviez' model: Estimate data on species diversity and numbers from P2 site characterizations in market modules
6	
7	Pull survey data to determine locations with hunters, what species hunted and hunting behaviors engaged in
8	Pull survey data to determine locations with hunters, what species hunted and hunting behaviors engaged in, determine whether these hunters hunt with Pteropus or Eidolon (seasonal bat species)
9	Identify cave sites with potential for measurement and develop sampling plan

	N	O
1	Point person	Collaborators
2	KJO	Evan, CKJ, Tracey, LVF, KS
3	CKJ	KJO, Anna W.
4	CKJ	Lucy K (SE Asia Markets), LVF, KS
5	CKJ	NR, Shirley Chen, KJO, CKJ, Sarah Olson, Brian Bird, Tracey
6	LVF,	Karen Saylor, Hongying Li, DJW
7	Stephanie Martinez	Leilani Francisco; Kevin Olival and Alice Latinne; Jon Epstein and Emily Hagan; Karen Saylor, Mat Lebreton, Jason Euren, and Dave McIver; Terra Kelly; Chris K Johnson and [REDACTED]; Jon Epstein and Emma Lane
8	JKM (to discuss with Evan and Stephanie regarding overlap with hunter behavioral risk above)	KJO, CKJ, Nistara, Diego, PD, EE
9	Kevin O.	Brian Bird; Kirsten & Julius; Lindsey Shields/Marc V.,

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1	comments
2	Existing data not likely super useful; KJO to work closely with CKJ on this given pverlap with other market projects
3	need to discuss bar coding
4	Existing data not likely super useful
5	CKJ to discuss plan with Shirley and Noam
6	
7	
8	What about dog/bat hunting in Lake Zone?; Add lab people if viral finding-dependednt
9	We havE MURONGO cave as well in TZ;

	A	B	C	D	E	F
10	9	Ecotourism/recreational/religious exposure to bat caves	Bat-tourist interaction	To survey P2 bat tourism sites to estimate tourist flow, origin, demographics, current safety measures, and tourist-bat interactions (contact risk) at these sites. Estimate reduction of risk with limitation on visitors / safety measures.	China, Malaysia, Myanmar, Rwanda, Uganda, Thailand, Senegal, DRC, Cameroon	Scenario Creation
11	10	Bat-community Interactions (including livestock)	SADS outbreak modeling - China	Developing and fitting model of SADS disease dynamics on chinese pig farms based on previous outbreak data	China	Scenario Creation
12	11	Bat-community Interactions (including livestock)	Bat-pig contact risk of new EIDs	Identifying the likely mechanism for contact between SADS host bats and pigs to assess if this could be generalizable to other countries and other viruses.	China	
13	12	Bat-community Interactions (including livestock)	Regional risk of a bat-pig outbreak	Identify areas with swine-bat overlaps similar to SADS conditions	Bangladesh, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, India, Malaysia, Myanmar, Senegal, Sierra Leone, Tanzania, Uganda, Viet Nam	Similarity Analysis; ecological niche modeling?
14	13	Bat guano farming/harvesting	Bat-harvester interaction	Survey caves to estimate harvester populations and practices. Estimate reduction in risk with reduced or modified practices.	Cambodia, DRC, Malaysia?, Myanmar, Thailand, Vietnam	Scenario Creation
15	14	Bat guano farming/harvesting	Bat guano farming	Determine viral survival associated with guano preparation practices	Cambodia, DRC, Myanmar, Thailand, Vietnam, Indonesia, CIV, ROC, Rwanda	Scenario Creation
16	15	Shared food resources	Fruit bat-livestock-orchard overlap	Identify areas most likely to have human-fruit-bat interactions using species ranges and agricultural data	Bangladesh, Cameroon, Cote d'Ivoire, Ghana, Guinea, Malaysia, Myanmar, Rwanda, Sierra Leone, Tanzania, Uganda, India?, Senegal, Nepal?, Jordan?	Similarity Analysis
17	16	Shared food resources	Bat-palm sap overlap	Identify areas where bat populations and viral propensities overlap with palm sap harvesting practices	Bangladesh, -Cameroon?, Cote d'Ivoire, DRC, Ghana, Guinea?, Malaysia, Myanmar, Sierra Leone?, Tanzania, -India?	Similarity Analysis

	G	H
10	Target sites and safety measures by site	Zoos/sanctuaries module data if available; as applicable, ethnographic interviews and focus group data
11	Recommendations for intervention in new SADS outbreaks	PREDICT-2 virus identification
12	Recommendations for prevention of SADS transmission between bats to pig in industry	
13	Areas for increased surveillance and bat-livestock separation based on previous Nipah work	
14	Target caves/guano farms and safety measures by cave/guano farms	
15	Time frames and practices for guano preparation	PREDICT-1 and PREDICT-2 site data about guano harvesting, PREDICT-1 viral detections at that interface
16	Areas for increased surveillance and bat-livestock separation based on previous Nipah work	
17	Areas for palm sap safety interventions	

	I	J
10	Publicly available online data on tourism, airline flight volume data (e.g. EHA's FLIRT app)	Estimates of efficacy of safety measures from published literature
11	High-resolution data of SADS disease mortality	Vaccination and other intervention efficacy based of PEDV
12		CoVs PCR and Serologic testing, barcoding
13	IUCN species ranges, FAO livestock layers	Bat-swine separation policy procedures based on Nipah work
14		Estimates of efficacy of safety measures from published literature
15	Viral survival lit review	
16	IUCN species ranges, FAO livestock layers, FAO and associated crop/orchard layers, population density maps; ; Na's work; Richard Suu-ire's project in Ghana	Literature or country-level descriptions to determine specific types of fruit tree resources: map layers are general for tropical fruit
17	IUCN species ranges, HP3 and known viruses hosted by bat species	Literature or country-level descriptions to determine specific types of fruit tree resources: map layers are general for tropical fruit

	K	L
10	Observations of safety measures, disturbance, and tourist-bat interactions at sites. Publicly available (de-identified) data on tourist flow, origin, and demographics; safety measures; and, bat-tourist interactions (e.g., from tourism authority, etc.)	Long
11	Expected additional information to be provided via Jingun Ma on farm structure - solicited, no additional field collection.	Med
12	Limited additional field work at targeted pig farm sites. Infrared and echolocation detection of bats on farms. Bat species ID from pig farms from trapping; and surveys of roost presence on farms.	Med
13	None	Short
14	Observational data on harvester numbers, frequency and duration of visits, harvests and safety practices, current safety measurements in place at cave and farm sites	Long
15	Experimental viral survival in bat feces (UCD or WIV? lab)	Long
16	None	Short-med
17	None	Med

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10	ID target sites and generate a sampling plan
11	Currently underway
12	Experimental design meeting follow-up
13	Determine characteristics of SADS-CoV spillover locations
14	ID target caves/guano farms and generate a sampling plan
15	
16	Determine characteristics of spillover locations to drive similarity analysis, data availability review
17	Determine whether palm sap harvesting practices data are likely to be adequate

	N	O
10	Stephanie Martinez	Leilani Francisco; Kevin Olival and Alice Latinne; Peter Daszak and Hongying Li; Jon Epstein and Allison White; Marc Valitutto and Lindsey Shields; Kirsten Gilardi; Karen, Mat, Jason, and Dave; Corina and Jaber
11	Noam Ross	Zhengli Shi, Hongying Li, Peng Zhou, Jingyun Ma
12	Hongying	Guangjian, other China collaborators
13	Shirley Chen	Carlos, Noam Ross
14	Shirley Chen	Karen Saylor, David McIver, Suzan Murray, Lindsey Shields, Marc Valitutto, Kevin Olival, Alice Latinne, Tracey Goldstein, Lucy Keatts, Amanda Fine, Sarah Olson
15	Tracey Goldstein	Simon, Peter, KJO, Zhengli Shi (?), Hongying Li
16	Shirley Chen	Carlos, Nistara (DTRA-funded work identifying orchards from Satellite), JAKM, David Wolking, Terra Kelly, Brian Bird?, Jon Epstein, Kirsten Gilardi, Corina Monagin, Lindsey Shields, Marc Valitutto, Kevin Olival, Anne Laudisoit
17	Shirley Chen	Jon Epstein, Kevin Olival, Lindsey Shields, Marc Valitutto, Anne Laudisoit, David Wolking

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10	We have Murongo cave as well in TZ; Rwanda won't approve the IRB
11	
12	Data collection is expected to start in September 2018
13	DJW and Ian if behavior/social related?; Terra & Richard data from Ghana; Consider in-country people
14	
15	Tracey to next assess availability of suitable virus isolate for experiment
16	Discuss in-country people
17	Consider which countries are really harvesting sap & then build team

	A	B	C	D	E	F	G
1	Topic	Project Name	Description	Potential Countries	Analysis Type	Expected Policy Products or Recommendations	Existing PREDICT Data
2	Shared food resources	Fruit bat-livestock-orchard overlap	Identify areas most likely to have human-fruit-bat interactions using species ranges and agricultural data	Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda	Similarity Analysis	Areas for increased surveillance and bat-livestock separation based on previous Nipah work	
3	Medium and large market value chains	Converting live markets to non-live	Estimating reductions in viral density/diversity as a result of change from live to non-live markets. Compare estimated viral diversity and density in a live market to an equivalent non-live market or live market with fraction of time, volume, or species converted to non-live.	Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam	Mixed Data Modeling/Scenario Creation	Expected degree of risk change from full conversion of markets, Expected efficacy of partial conversions and closures Identification of markets with potential for conversion	PREDICT-1 viral detection data from live and non-live samples in markets
4	Medium and large market value chains	Upstream vs. local viral diversity	Compare viral detection rates of species in markets to the same species at their sources	Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam	Data Modeling	Recommendations whether to focus on upstream or in-market interventions to reduce spillover	PREDICT-1 viral detection data
5	Bat-community Interactions (including livestock)	Regional risk of a bat-pig outbreak	Identify areas with swine-bat overlaps similar to SADS conditions	Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda	Similarity Analysis; ecological niche modeling?	Areas for increased surveillance and bat-livestock separation based on previous Nipah work	
6	Bat Hunting and hunted meat value chain	Hunter Behavioral Risk Hotspots	Identify areas with highest risk of viral spillover to hunters based on risky behavior, propensity of local bat species to carry viruses, and likelihood for bats to be sold into value chain	Bangladesh, China, DRC, Ghana, Indonesia, Nepal, RoC, Sierra Leone	Data Modeling	Target locations and behaviors for educational interventions	PREDICT-2 questionnaire data on hunter behavior
7	Bat Hunting and hunted meat value chain	Bat Hunting Seasonality	Identify areas of bat hunting associated with high risk seasonality in bat viral detection	Bangladesh, China, DRC, Ghana, Indonesia, Nepal, RoC, Sierra Leone	Data modeling	Target locations and seasons to reduce bat hunting/drive education	PREDICT-2 questionnaire data on hunter behavior PREDICT-1 viral detections

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	Other Existing Data Assets	Non-field Data Collection	Additional Field Data Collection	Time Frame (3 mo, 6 mo, 1 yr)	Probability of Success (Low, Med High)	Action items	Point person	Collaborators
1	IUCN species ranges, FAO livestock layers, FAO and associated crop/orchard layers, population density maps; ; Na's work; Richard Suu-ire's project in Ghana	Literature or country-level descriptions to determine specific types of fruit tree resources: map layers are general for tropical fruit		Short-med		Determine characteristics of spillover locations to drive similarity analysis, data availability review	Brooke Watson	Carlos, Erica, Nistara (DTRA-funded work identifying orchards from Satellite), JAKM (Cashews)
2		Literature review of viral survival at EHA (collected but not analyzed)		Short		Determine which countries are we sampling from dead animals in non-live markets. Can we identify comparable live and non-live markets?	CKJ	
3			Market-upstream site associations from field teams	Short		Determine what P1 cases have same species in both markets and linked upstream sources	Kevin	Evan, CKJ
4	IUCN species ranges, FAO livestock layers	Bat-swine separation policy procedures based on Nipah work		Short		Determine characteristics of SADS-CoV spillover locations	Brooke Watson	Carlos, Erica
5	IUCN species ranges, HP3 viral risk propensities		Country team estimation of exact bat species being hunted	Med		Pull survey data to determine locations with hunters, what species hunted and hunting behaviors engaged in	CKJ	KJO, Anna Willoughby
6	IUCN species ranges		Country team estimation of exact bat species being hunted	Med		Pull survey data to determine locations with hunters, what species hunted and hunting behaviors engaged in, determine whether these hunters hunt with Pteropus or Eidolon (seasonal bat species)	CKJ	KJO, Evan, Nistara, Diego,PD, JAKM
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8	Shared food resources	Bat-palm sap overlap	Identify areas where bat populations and viral propensities overlap with palm sap harvesting practices	Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda	Similarity Analysis	Areas for palm sap safety interventions	
9	Bat-community Interactions (including livestock)	SADS outbreak modeling - China	Developing and fitting model of SADS disease dynamics on chinese pig farms based on previous outbreak data	China	Scenario Creation	Recommendations for intervention in new SADS outbreaks	PREDICT-2 virus identification
10	Bat-community Interactions (including livestock)	Bat-pig contact risk of new EIDs	Identifying the likely mechanism for contact between SADS host bats and pigs to assess if this could be generalizable to other countries and other viruses.	China			
11	Medium and large market value chains	Reducing market biodiversity	Estimating potential for viral recombination in markets based on species diversity and count using previously created recombination model.	Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam	Mixed Data Modeling/Scenario Creation	Identification and ranking of markets with high recombination risk, recommendations for species segregation for those markets	PREDICT-2 Species and number of animals (live) in markets (Site and Event characterization - Main Q15)
12	Medium and large market value chains	Assessing viral sharing within market species	Within common or nearby markets, determining which species share viruses in order to recommend separation. Determine viral sharing both within specific markets, and for all PREDICT-1 (and other) data for species found in the same market	Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam	Data Modeling	Recommendations for species segregation to reduce spread,	PREDICT-1 viral detection data from markets PREDICT-1 and PREDICT-2 species presence in markets
13	Medium and large market value chains	Will policies for market-based interventions be accepted?	The intervention policy ideas that we are generating above, and others, may not be acceptable to governments or people within countries. This project will assess their likelihood of becoming government policy, or being adopted by people.	Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam	Mixed Data Modeling	Recommendations that are more likely to be adopted	PREDICT-1 and PREDICT-2 behavioral risk data
14	Ecotourism/recreational/religious exposure to bat caves	Bat cave biodiversity risk	Estimating potential for recombination of viruses in bat-dwelling caves	China, Malaysia, Myanmar, Rwanda, Uganda	Mixed Data Modeling/Scenario Creation	Risk characterization by cave site/size/type	
15	Ecotourism/recreational/religious exposure to bat caves	Bat-tourist interaction	Survey bat caves associated with predict to estimate tourist flow and demographics, current safety measures, contact risk. Estimate reduction of risk with limitation on visitors / safety measures.	China, Malaysia, Myanmar, Rwanda, Uganda	Scenario Creation	Target caves and safety measures by cave	
16	Bat guano farming/harvesting	Bat-harvester interaction	Survey caves to estimate harvester populations and practices. Estimate reduction in risk with reduced or modified practices.	Cambodia, DRC, Myanmar, Thailand, Vietnam	Scenario Creation	Target caves and safety measures by cave	

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8	IUCN species ranges, HP3 and known viruses hosted by bat species	Literature or country-level descriptions to determine specific types of fruit tree resources: map layers are general for tropical fruit		Med		Determine whether palm sap harvesting practices data are likely to be adequate	JHE	
9	High-resolution data of SADS disease mortality	Vaccination and other intervention efficacy based of PEDV		Med		Currently underway	Noam Ross, Cale Basaraba	
10			Infrared and echolocation detection of bats on farms.	Med		Experimental design meeting follow-up	Hongying, Guangjian, other analytical people	
11			More accurate species characterization and counts in identified markets of interest	Long		Estimate data on species diversity and numbers from P2 site characterizations in market modules	CKJ	KJO, Sarah Olson
12	HP3 viral associations		More accurate species characterization and counts in identified markets of interest	Long		Estimate data on species diversity and numbers from P2 site characterizations in market modules	CKJ	KJO, Alice Latinne
13	Surveys of current policies within country, literature review		Targeted qualitative data and focus groups. Interviews with Govt. agencies.	Long			LVF, Saba Qasmieh	Karen Saylors, Hongying Li
14	HP3 and Cave bat viral sharing analysis	Find literature-based bat-specific viral sharing/recombination rates	Cave bat species diversity and composition and multiple cave sites	Long		Identify cave sites with potential for measurement and develop sampling plan	KJO	Anna Willoughby
15		Estimates of efficacy of safety measures from published literature	Data on visitor flow, demographics and origin. Data on current safety measures implemented Observation on tourist-bat interaction measures	Long		ID target caves and generate a sampling plan	LVF	Karen Saylors, Stephanie Martinez
16		Estimates of efficacy of safety measures from published literature	Data on harvester numbers, frequency and duration of visits, harvets and safety practices, current safety measurements in place.	Long		ID target caves and generate a sampling plan	LVF	Karen Saylors, Suzan Murray

	A	B	C	D	E	F	G
17	Bat guano farming/harvesting	Bat guano farming	Determine viral survival associated with guano preparation practices	Cambodia, DRC, Myanmar, Thailand, Vietnam	Scenario Creation	Time frames and practices for guano preparation	PREDICT-1 and PREDICT-2 site data about guano harvesting, PREDICT-1 viral detections at that interface

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17	Viral survival lit review		Experimental viral survival in bat feces (UCD lab)	Long			Tracey, Jonna	Simon, Peter, Kevin,